

Classification and Imaging Study of the Lumbar Disc Herniation

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– Abstract –

It is known that the lifetime prevalence of low back pain approximates 80%, with long standing low back problems in roughly 10% to 20% of the population. The symptoms of sciatica due to nerve root compression most often relate to aberration of the lumbar intervertebral disc. Lumbar disc herniation is defined as herniation of nucleus and/or anulus fibrosus through the tear of the anulus fibrosus. According to the degree, it has been classified as a bulging disc, a protruded disc, a extruded disc, and a sequestrated disc. Also it has been classified as central, posterolateral, and foraminal herniation by the location of the herniation. The four imaging studies most frequently ordered to evaluate lumbar disc herniation are plain x-ray films, myelography, computed tomography, and magnetic resonance imaging. Each test provides useful information about lumbar disc herniation. However, before the selection of a test, the category of the clinical problem must be defined and imaging abnormalities must be correlated with historical and physical findings. Many errors in decision making with imaging studies of lumbar disc herniation do not come from misinterpretation of what is seen on the images; instead, they are related to how the imaging information is used and integrated into the clinical decision-making process.

Key Words : Lumbar spine, Disc, Herniation, Imaging study, Classification

80%

20~40

4-5

가

2-3

3-4

12,18,19)

가

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1) (Fig. 1-A). (Fig. 1-B). (Fig. 1-C). (Fig. 1-D). (Fig. 1-E). (Fig. 1-F). (Fig. 1-G). (Fig. 2)

(protruded disc), (extruded disc), (sequestrated disc) (Ring apophyses) (Bulging disc) 3 mm (protruded disc) (extruded disc) (sequestrated disc) (Intradiscal herniation) (Intravertebral herniation, Schmorl's node)가

(1) (2) (3) (4)

(Central midline herniation) (Posterolateral herniation) (Foraminal herniation) (Far lateral herniation) (Extraforaminal herniation)

(cauda equina) 1~11.7% 40~60% 9,11, 60% 4-5 4-5 1 5 4 5 1 3

3) McCulloch¹⁴⁾ three-story "three-story house" (Fig. 3-A). (Fig. 3-B),

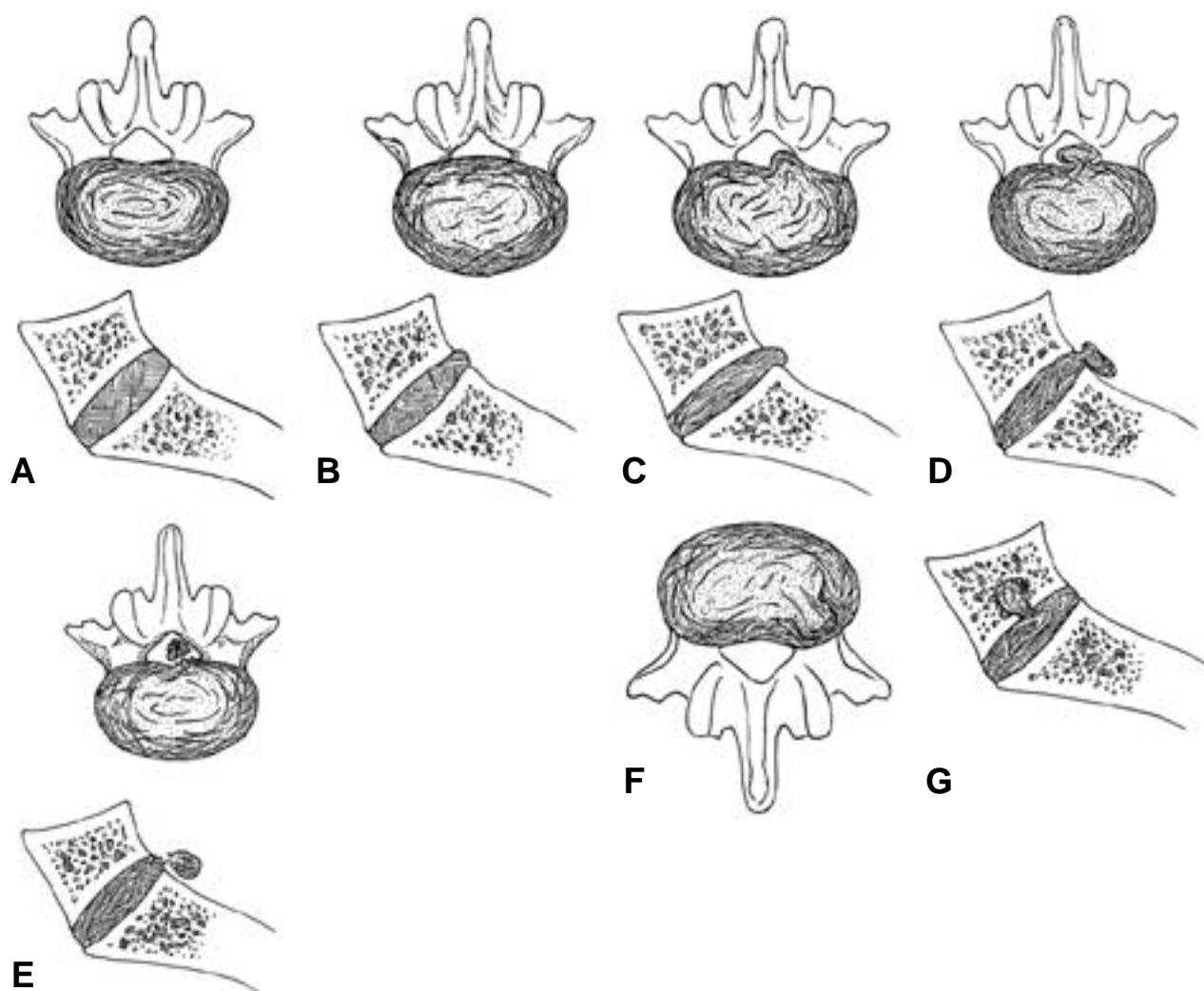


Fig. 1-A. Normal disc. The posterior surface is slightly concave centrally relative to the plane of the posterior - most projection of the vertebral apophyses.

B. Bulging disc. The posterior surface is symmetrically centrally convex and the disc protrudes up to 3 mm beyond the bone surfaces. Anulus fibers are intact. Bulging is clinically insignificant in some circumstances.

C. Protruded disc. Disc material extends beyond the normal disc space, usually asymmetrically. The anulus is partially disrupted but still contains displaced disc material, which maintains broad continuity with the parent disc.

D. Extruded disc. Displaced disc maintains continuity with the parent disc by a relatively narrow pedicle and is either uncontained or contained by attenuated fibers of a largely disrupted anulus, peridural membrane, or posterior longitudinal ligament.

E. Sequestered disc. Displaced disc material, which may contain elements of nucleus, anulus, and/or cartilage, has no continuity with the disc of origin.

F. Intradiscal herniation. Predominantly nuclear tissue has shifted from the center of the disc into a fissure in the peripheral anulus. This concept of herniation differs from those of figures 1-A to 1-E in that the outer contour of the disc remains normal.

G. Intravertebral herniation (Schmorl's node). Disc material has herniated through cartilagenous and bony end plate and into the spongiosa of the vertebral body.

2 3 (Fig. 3- , 2
C, D). , 3

1 (Fig. 3-E).

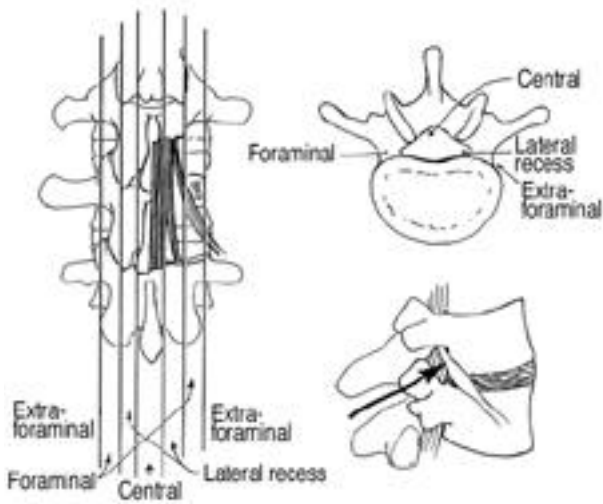


Fig. 2. Location of disc herniation in the spinal canal

1)

1895

X-

4

가

가

¹⁶⁾(Table 1).

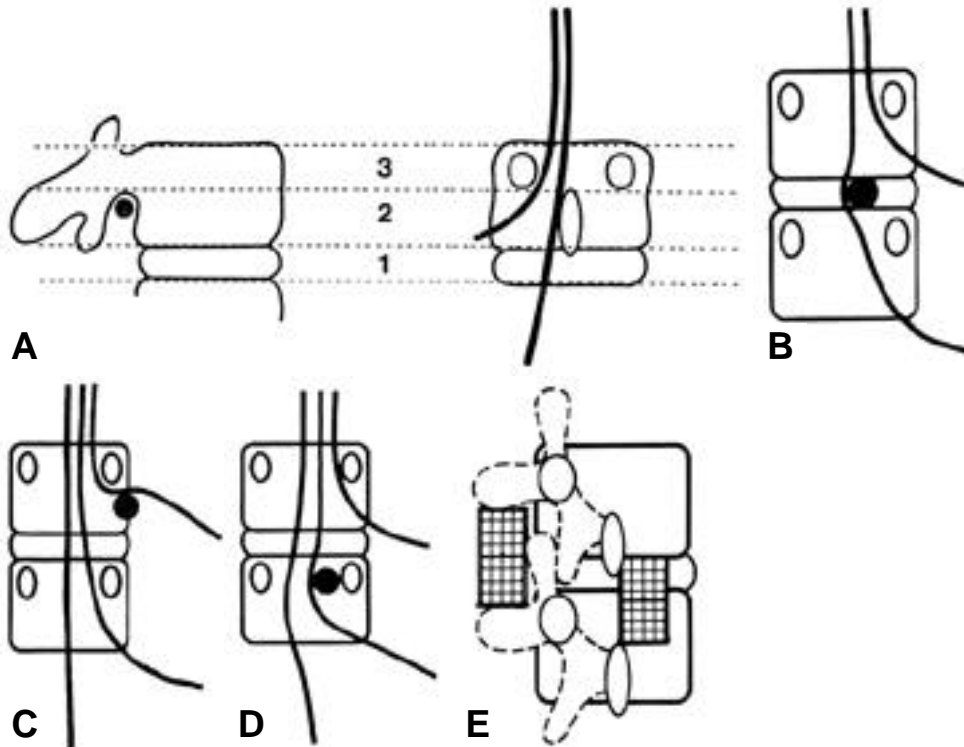


Fig. 3-A. Three-story house. First story (1) - disc space level, second story (2) - foraminal level, and third story (3) - pedicle level . This concept aids preoperative planning and operative localization.

B. First story disc herniation at the level of the disc space.

C. Second story disc herniation. The disc has migrated inferiorly to the third story of the segment below.

D. Third story disc herniation. The disc has migrated inferiorly to the third story of the segment below.

E. McCulloch's windows of opportunity : Medial interlaminar window and lateral intertransverse window.

3)

2)

1918 Dandy⁵⁾가

1970

(pantopaque)

(amipaque)

²⁾,

MRI

가 .

CT MRI

, , , ,

CT MRI

가

가

가

(Dorsal root ganglion)

가 .

가 가

5

Root sleeve defect, Lateral indentation
of the sac Hour-glass defect Block defect
Lateral indentation 가¹⁷⁾.

가

가

Table 1. Radiologic abnormalities in the lumbar spine with significance for low back pain

Classification	Abnormality
Irrelevant	Single disc narrowing and spondylosis
	Facet arthrosis, subluxation, and tropism
	Disc calcification
	Lumbarization, sacralization
	Intraspongy disc herniation(Schmorl's nodes)
	Spina bifida occulta
	Accessory ossicles
	Mild-moderate scoliosis
Questionable	Spondylolysis
	Retrolisthesis
	Severe lumbar scoliosis(> 80°)
	Severe lordosis
Definite	Spondylolisthesis
	Lumbar osteochondrosis(Scheuermann)
	Congenital/traumatic kyphosis
	Osteoporosis
	Marked multiple disc narrowing
	Ankylosing spondylitis

From Ref 16. Nachemson

(bulging disc)

가

(protruded disc)

²⁰⁾.

size가 ,

가 가 ,

, size가 , 가 가

가 .

4)

1977

¹³⁾

가

가

⁸⁾.

spin echo
T1 T2
Gd-DTPA가
Gadolinium-labeled diethylenetriamine pentaacetate
가
10)
Failed back surgery syndrome
T1, T2
가
T1 가
T2
T1 T2
가
T2
가
Spin echo MR T2
Gadolinium
4)
1)
(intranuclear cleft)
가
75%,
82~90%
77-83%,
7,15)
가
가 , 가
(radial tear)
가
가
T2
20%, 40
27%
20)(Table 2),
22%, 60 36%
3)(Table 3),
(Extruded disc)
가
가
(Sequestered disc)
(parent disc)
가 , 가
(postoper-
ative scar adhesion)
Gadolinium
가
가
T2
30%

Table 2. Computed tomography results on normal subjects

CT results: "normal subjects"(N=52)		
	Age	
	Under 40	Over 40
Herniated disc	20%	27%
Spinal stenosis	0%	3%
Facet abnormality	0%	10%
Any abnormality	20%	50%

From Ref 20. Wiesel et al.

Table 3. Magnetic resonance imaging results on normal subjects

MRI results: "normal subjects"(N=67)		
	Age	
	Under 60	Over 60
Herniated disc	22%	36%
Spinal stenosis	1%	21%
Bulging disc	54%	79%
Degenerated disc	46%	93%

From Ref 3. Boden et al.

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